



EPOXY PAVEMENT MARKING MSP-99-01D

1.0 Description. This specification covers the furnishing and placing of an epoxy pavement marking system on Portland cement concrete and bituminous pavements.

2.0 Material.

2.1 Epoxy Pavement Marking Material. Epoxy pavement marking material shall not contain toxic heavy metals. It shall be two component, 100 percent solids, and formulated and tested to perform as a pavement marking material with glass beads applied to the surface. The two components shall be epoxy resin and an amine curing agent.

2.1.1 Type A Epoxy Marking. Type A epoxy marking shall be used for all epoxy pavement marking, except when specified otherwise in the contract. Type A epoxy marking is a slow cure material suitable for all applications of pavement markings and intended for use on all new pavements not open to traffic.

2.1.2 Type B Epoxy Marking. Type B epoxy marking is a fast cure material suitable for line applications and intended for use on bituminous pavements open to traffic.

2.1.3 Toxicity. Upon heating to application temperature, the material shall not release fumes that are toxic to persons or property. Upon curing, the material should be completely inert, with all components fully reacted and environmentally benign.

2.1.4 No Track Time. The material shall have a no-track time between 10 and 45 minutes for Type A and 10 minutes or less for Type B, when mixed in the proper proportions and applied at 25 mils (0.625 mm) wet film thickness at 75 ± 2 F (24 ± 1 C) with the proper application of glass beads and when tested in accordance with ASTM D 711. The material shall fully cure under a constant surface temperature of 32 F (0 C) or above.

2.1.5 Adhesion to Concrete. The pavement marking material shall have a high degree of adhesion to the concrete surface such that there is a 100 percent concrete failure when tested in accordance with ACI 503, Appendix A.1. The prepared specimens shall have a film thickness of 15 ± 1 mils (0.375 ± 0.025 mm) and be applied to concrete with a minimum compressive strength of 4000 psi (28 MPa). The concrete surface shall be 90 ± 2 F (32 ± 1 C) when the material is applied. The applied material shall be cured for 72 hours at 75 ± 2 F (24 ± 1 C) before performing the test.

2.1.6 Hardness. The material shall have a minimum Shore D Hardness of 75 when tested in accordance with ASTM D 2240.

2.1.7 Tensile Strength. The material shall have a minimum tensile strength of 6,000 psi (42 MPa) after 72 hours cure at 75 ± 2 F (24 ± 1 C) when tested in accordance with ASTM D 638.

2.1.8 Compressive Strength. The material shall have a minimum compressive strength of 12,000 psi (84 MPa) after 72 hours cure at 75 ± 2 F (24 ± 1 C), when tested in accordance with ASTM D 695.

2.1.9 Abrasion Resistance. The material shall have a maximum abrasion resistance of 150 mg at 15 ± 1 mils (0.375 ± 0.025 mm) thickness after 72 hour curing time and with a CS-17 wheel under a load of 1000 grams for 1000 cycles, when tested in accordance with ASTM C 501.

2.1.10 Yellowness Index. The material shall have a maximum yellowness index of 6 before the QUV test and a maximum of 23 after the 72 hour QUV test, when tested in accordance with ASTM D 1925.

2.1.11 Color. The finished white color shall be free from tint, furnishing good opacity and visibility under both daylight and artificial light. The finished yellow color shall be defined by Federal Test Standard 595- Color Chip Number 13538, using Federal Tests Standard 141 (Method 4252).

2.1.12 Accelerated Weathering. The material shall have been field tested at NTPEP test decks for a minimum of six months. The material shall have satisfactory results from the NTPEP test deck.

2.2 Drop-on Glass Beads. Type 1 moisture-resistant glass beads shall be in accordance with [Sec 1048.6.1 Type 1 Drop-On Glass Beads](#).

3.0 Sampling, Testing and Acceptance. The inspector shall have free access to the material and all facilities for purpose of inspection. The engineer reserves the right to sample at the point of manufacture, at intermediate points, or at destination. Each batch or lot shall be sampled and approved prior to use. The contractor shall provide the necessary tools to adequately mix all shipping containers prior to obtaining samples or transferring partial containers of material to tanks on the striping equipment.

3.1 The material, at the time of use, shall comply with all provisions of this specification, and be capable of being dispersed with a paddle to a smooth, uniform consistency. Any material that cannot be remixed to a smooth, uniform consistency shall be disposed of and immediately replaced with acceptable material. Both components of epoxy pavement marking material may be prone to separation and settling in the shipping container. Samples shall only be obtained from wellmixed containers.

4.0 Certification. The contractor shall furnish a manufacturer's certification to the engineer for each lot furnished, certifying that the material supplied conform to all requirements specified. The certification shall include or have attached typical results of all required tests. Acceptance of the material will be based on the manufacturer's certification and upon results of such tests as may be performed by the engineer. The certification shall show the quantity and lot number it represents.

5.0 Packing. The pavement marking material shall be shipped to the job site in strong, substantial containers. The manufacturer shall include the MSDS with each shipment. The manufacturer's name and address, name of the product, lot number and/or batch number, color, tare weight, manufacturing date, date of expiration, mixing proportions and if it is Part A or B shall be contained on a label and/or painted on the containers.

6.0 Construction Requirements.

6.1 Equipment. The application equipment shall have a system capable of spraying both yellow and white epoxy pavement marking material in the proportions recommended by the manufacturer. The application equipment shall be mounted on a truck of sufficient size and stability with an adequate power source to produce lines of uniform dimension and prevent application failure. It shall be capable of placing lines on the left and right sides and of placing two lines simultaneously with either line in a solid or intermittent pattern in yellow or white. All guns shall be in full view of the operator at all times. The application equipment shall include the following features:

(a) Individual material reservoirs, or space, for storage of Part A and Part B of the epoxy material, equipped with the necessary stirring or blending equipment to ensure delivery of uniformly mixed components to the static mixer unit.

(b) Heating equipment of sufficient capacity to maintain the individual components at the manufacturer's recommended temperature and capable of producing the required amount of heat at the mixing head and gun tip to maintain those temperatures within the tolerances recommended by the manufacturer for spray application.

(c) Tanks for the storage and dispensing of Type 1 glass beads.

(d) A dispenser for the application of Type 1 glass beads. The dispenser shall be capable of applying glass beads at a minimum rate of 25 pounds of beads per gallon (2.5 kg/L) of the combined epoxy. The applied Type 1 glass beads shall be applied at a minimum of 25 pounds per gallon (2.8 kg/L). (e) Individual metering devices or pressure gauges on the proportioning pumps (one indicator per pump) as well as stroke counters to monitor gallon (liter) usage. All such devices shall be visible to the engineer.

(f) A minimum 24-inch (600 mm) long static mixer unit manufactured by Kenics Company or equal for proper mixing of the two components.

(g) A completely enclosed flush and purge system to clean the lines and guns without releasing any of the solution into the environment.

(h) The necessary spray equipment, mixers, compressors and other appurtenances to allow for the placement of reflectorized pavement marking material in a simultaneous sequence of operations.

(i) If arrows, words, symbols or markings other than lines are specified in the contract, the application equipment shall have the necessary spray equipment or wands to place these markings.

6.2 Transfer of Material. The contractor shall provide all necessary equipment to adequately mix each shipping container. At any time that partial shipping containers are transferred to the reservoirs on the striping equipment, complete mixing of that container shall be performed prior to beginning transfer.

6.3 Surface Preparation. The pavement surface on which the pavement marking is placed shall be free of all debris, laitance and any other contaminants that may hinder the adhesion of the system to the surface. Whenever grinding, scarifying, sandblasting,

shot blasting or other operations are performed, the debris generated must be contained through vacuum type equipment or equivalent. The work shall be conducted in such a manner that the finished pavement surface is not damaged or left so it will mislead or misdirect the motorist. Any excess damage or scarring of the pavement shall be repaired at the contractor's expense.

6.3.1 Removal and cleaning work shall be conducted in such a manner as to control and minimize airborne dust and similar debris that may become a hazard to motor vehicle operation or nuisance to property owners.

6.3.2 Care shall be taken on bituminous and Portland cement concrete surface when performing removal and cleaning work to prevent damage to transverse and longitudinal joints.

6.3.3 The pavement surface shall be power broomed and then blown with compressed air to remove residue and debris resulting from the cleaning work, after all cleaning operations are completed. All such debris must be properly contained and disposed of in the appropriate manner, especially when removing yellow pavement markings.

6.3.4 Limits of Work. Cleaning and surface preparation work shall be confined to the area specified for the application of the pavement marking materials; or the surface area of existing pavement markings that are specified for removal on the plans, or as directed by the engineer.

6.3.4.1 Surface preparation work includes cleaning for lines, letters and symbols.

6.3.4.2 When lines are cleaned, the area of preparation shall be the width of the new pavement marking, or existing line, plus one inch (25 mm) on each side of the line. When letters and symbols are cleaned, the area of preparation will be sufficiently large to accommodate the new marking or to remove existing markings.

6.3.5 Removal of Concrete Curing Compound. On new Portland cement concrete pavements, cleaning operations shall not begin until the concrete has attained the minimum design compressive strength, as determined by MoDOT test methods. The extent of the curing compound removal work shall be to clean and prepare the concrete surface such that:

- (a) There shall be no visible evidence of curing compound.
- (b) The extent of the removal shall be as such to ensure any laitance is removed on both old as well as new concrete.

6.3.6 Removal of Existing Pavement Marking. All existing pavement markings, except epoxy pavement markings, shall be removed to the extent that 95 to 100 percent of the existing marking is removed. Existing epoxy pavement markings that are in good condition and that will not interfere with or otherwise conflict with newly applied markings, as determined by the engineer, may be allowed to remain. Removal operations shall be conducted in such a manner that no more than moderate color and/or surface texture change results on the surrounding pavement surface. The engineer will make the determination of acceptable removal.

6.4 Application. The pavement marking material shall be applied to the road surface at 25 mils (0.625 mm) on concrete or asphalt pavements through the use of equipment designed to precisely meter the two components in the ratio recommended by the material manufacturer.

6.4.1 Under controlled traffic conditions, Type A epoxy marking may be used but coning will be required and flagging may be as directed by the engineer. Under ideal conditions, Type B epoxy marking may not require coning.

6.4.2 Atmospheric Conditions. The pavement marking shall only be applied during dry weather and on dry pavement surfaces. At the time of installation, the pavement surface temperature and ambient temperature shall be above 45 F (7 C).

6.4.3 Application Temperatures for the Material. Both components shall be brought to the temperature recommended by the manufacturer, prior to mixing and spraying. The temperature shall stay between 80 F (27 C) and 140 F (60 C).

6.5 Verification of Application Rates. The engineer will check application rates at convenient intervals by comparing the amount of material used to the lengths of pavement marking placed. For initial application and occasionally during the course of the work, the engineer may also check application rates by use of a wet film thickness gauge. Glass beads shall not be applied for testing application rates when using a wet film thickness gauge. The application rates for the glass beads shall be verified by means approved by the glass bead manufacturer.

6.6 Minimum Retroreflection. The pavement marking shall provide effective delineation on concrete and bituminous pavements and provide retroreflection requirements in accordance with Sec 620.

7.0 Final Acceptance. Final acceptance will be based on compliance with this specification to the satisfaction of the engineer. If the markings are not in accordance with these specifications for any reason, the engineer may require complete removal or correction at the contractor's expense.

8.0 Method of Measurement.

8.1 Measurement of 4-inch (100 mm) epoxy pavement marking will be made to the nearest linear foot (0.5 m) from the point of beginning to point of ending for each line. Where intermittent pavement marking is specified, deduction will be made for gaps.

8.2 Measurement of epoxy pavement marking arrows, words, symbols or markings other than lines will be made per each.

8.3 Measurement of 6-inch (150 mm), 8-inch (200 mm) and 24-inch (600 mm) epoxy pavement marking will be made to the nearest linear foot (0.5 m) of marking at the specified width.

8.4 Measurement for removal of pavement markings will be made to the nearest linear foot (0.5 m) as measured along the centerline of the pavement from the point of

beginning to point of ending for each line. Where intermittent pavement marking is specified or existing, deduction will be made for gaps in the removal.

8.5 Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity.

9.0 Basis of Payment. The accepted quantity of epoxy pavement marking will be paid for at the contract unit price.